

Sustainable Management of the Deduru Oya River Basin, Sri Lanka: A Case Study of Institutions, Organizations and Actors¹

S.A.P. Samarasinghe, R. Sakthivadivel, Hilmy Sally

Introduction

Development activities during the early nineteenth century were centered on plantation agriculture in the wet zone of Sri Lanka. But the near saturation of development of this sector coupled with high population pressure in the wet zone, food deficits, rural to urban migration, and unemployment soon led policy makers to develop the water resources in the dry and intermediate zones. Thereby it became possible to cultivate large extents of hitherto barren lands, resulting in the creation of conducive environments in the dry and intermediate zones to accommodate excess population from the wet zone. The selection criteria for entitlement of land under these settlements were mainly aimed at poverty alleviation rather than economic development *per se*, which resulted in the creation of an agrarian peasantry dependent on subsistence agriculture. Provision of other infrastructure facilities and basic amenities received less priority.

By the mid-1960s, the advent of the Green Revolution allowed the government to concentrate on the popularization of improved cultivation technologies that helped to increase average yields considerably and give rise to production surpluses.

Towards the early 1980s the main thrust in relation to irrigated agriculture shifted towards increasing productivity through rehabilitation of infrastructure and better management of water rather than expansion of irrigated areas. In order to achieve this objective the government promoted participatory approaches, deviating from the prevailing top down approach. But State authorities have been more concerned about using this approach for the mobilization of resources for operations and maintenance (O&M) and to transfer management responsibilities to beneficiary organizations instead of seeking true participation of farmer beneficiaries in decision making and implementation of jointly agreed upon programs.

Towards the late 1980s the country gained near self-sufficiency in rice through these interventions. Open market policies were also adopted at the same time. Attention shifted towards diversified cropping with a view to promoting income generation and economic development to benefit a growing population. The demand for water from other sectors also increased. Stringent environmental regulations and basic protection of cultural heritage and natural resources by constitutional amendments provided the much needed teeth for concerned individuals and groups to take action against activities liable to cause environmental degradation.

Such empowerment of communities resulted in situations where, for example, further development of water resources was not possible without giving due consideration to environmental sustainability. These changes have compelled the government to manage water resources in a holistic manner and to introduce incentives for users themselves to

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conserve water rather than using obsolete regulations that could not be implemented effectively, leaving alone the cost of enforcement. In addition, with increasing population and competition among various sectors, water is increasingly being viewed as an economic good rather than a purely social good. Appreciation of this fact required changes in the management strategy of scarce water resources that, in turn, called for changes in policies and institutions in keeping with the recognition that the basin was the most appropriate unit of management.

This paper examines the evolution of water related institutions in this country with special reference to the Deduru Oya river basin. Using Deduru Oya as a case study, typical issues that are surfacing following the developments enumerated above are highlighted. Some suggestions for making further progress in the implementation of integrated water resources management at the basin level are formulated.

Brief Description of Deduru Oya Basin

The Deduru Oya is 115 km long and has a catchment area of 2 623 km². It originates in the central hills of Sri Lanka (3% of catchment area) and runs for most of its length through the North Western Province (nearly 97% of catchment area) whose capital city is Kurunegala. A tiny portion (0.1%) is in the North Central Province (ECL, 1999). The Deduru Oya has a number of tributaries and the basin contains a number of small and large reservoirs (called tanks), as shown in the hydrographic map (figure 1). The Deduru Oya can be affected by flash foods in some periods but also suffer from long periods of low flows (generally February, March, June, July, August, and September).

The basin topography varies from the coastal flat plains on the western boundary to the rather hilly regions on its eastern boundary (elevation 700 m). It cuts across at least 3 main agro-ecological zones, as illustrated in figure 2. More than 90% of the land is devoted to agriculture (mainly coconut, paddy, home-gardens).

The basin includes 5 administrative districts and 28 divisional secretariat areas. However, about 87% of the basin is in the Kurunegala district. Nearly 1 million people live within the Deduru Oya basin, and the population density of around 350 persons/km² is greater than the national average of about 300 persons/km².

Some of the main socio economic and hydrological data in respect of the Deduru Oya basin have been summarized in the annex.

Evolution of Legislation

The prevailing laws on the development and use of water resources grant the authority to develop and use water resources to different government institutions while negating the riparian rights that any society would normally respect. As such, the empowerment of civil societies through the enactment of suitable legislation could not be realized. Instead, priorities for transfer of user rights are often determined by political considerations.

The State land ordinance passed in 1947 defines public and private watercourses. It also has provisions for regulation and control of large users of public waters and streams through a system of permits. This authority is vested with the District Secretaries (formerly Government Agents). These provisions have hardly been used and a formal procedure for granting permits has not evolved. State agencies have overcome this by

making provisions in their respective acts to give themselves the right to develop or use public water resources to meet their needs. Following are some of the important agencies that became entitled to develop or use water resources without further approval, and the year in which they gained such power (ECL,1999).

<u>Agency</u>	<u>Year</u>
Department of Irrigation	1946
Ceylon Electricity Board	1950
National Water Supply & Drainage Board	1974
Mahaweli Authority of Sri Lanka	1979
Provincial Councils (13 th Amendment)	1987
National Aquatic Resources Authority	1996

Though such acts were passed, none of these institutions could use its authority to use water from already developed sources overriding the riparian rights, recognized by society but not by the law. This has led to greater demand for water from different sectors and even conflicts, where arriving at an amicable solution proves to be quite difficult.

Sectoral Development Within Deduru Oya Basin

Irrigation Development

The Department of Irrigation (ID) commenced developing the water resources in Deduru Oya in the 1870s, much before the other agencies stepped in. Therefore it is customary for other agencies to seek the concurrence of ID before embarking on any development activity in the basin. At present most of the water withdrawn from Deduru Oya basin is used for irrigation. The salient features of the more important irrigation schemes in the basin are included in the annex.

Domestic Water Supply

Three types of water supply projects exist in the basin:

- Constructed and managed by the National Water Supply & Drainage Board (NWS&DB)
- Constructed by NWS & DB and managed by the local bodies (*Pradeshia Sabhas*)
- Constructed by NWS&DB and managed jointly by the Pradeshia Sabha and the community.

The number of beneficiaries of these schemes is insignificant. Only about 2% of the population has access to pipe borne water; the rest depend on wells, private or communal (ECL, 1999). Furthermore, water supply is often limited to only a few hours a day.

For example, consider the case of the water supply scheme for Kurunegala (the capital city of the North Western Province), which draws water from Deduru Oya just below the diversion weir that diverts water to the Batalagoda irrigation scheme (about 2400 ha command area), managed by the Irrigation Department. The return flow from Batalagoda scheme is discharged back to the river, downstream of the city supply point. There appear to be no formal rules for the release of water to the city water supply (Sakthivadivel, 2000). However, the irrigation department and water supply officials have some informal arrangements for the release of water to the city during times of

drought. During dry months, almost the entire flow of the river is diverted to the Batalagoda scheme and what is available for domestic water supply is the meager flow received in the Kospothu Oya a tributary with its confluence between the Batalagoda diversion and the city supply point. As a result the city water supply suffers severe shortages and finds it increasingly difficult to meet the demands of an increasing urban population.

Most of the tube well waters in the basin contain salt and iron compelling planners to tap surface and shallow ground water for domestic supply, which has to come either from new storage reservoirs or from water earmarked for agriculture. The major source of drinking water supply is dug wells but the presence of high salt content, especially towards the sea mouth, has compelled users to buy water at exorbitant prices.

Lift Irrigation

Apart from three lift irrigation schemes managed by the ID (total 170 ha) and one under construction, there are a large number of private lift irrigation schemes in Deduru Oya, notably in the downstream reach of the river. These users generally do not have explicit authorization for water extraction but have acquired their rights by using it over a long period of time. However, their 'rights' can be withdrawn without notice compelling them to give up cultivation. On the other hand, given the investment made and the productivity levels attained, it would be difficult to deprive them of the use of water. What is needed is a means of incorporating these 'informal' users into the formal system. A proper inventory of these users is not available but a rough estimate verified with many sources indicates that the number of such users exceeds 1000.

As these users are not officially recognized, none of the upstream developments being contemplated have taken this water use into consideration. Such developments could thereby give rise to serious social problems. As these groups do not receive the patronage of any of the agencies participating in decision making, their views are not represented and therefore go unnoticed. The only choice they are ultimately left with is to seek political support.

Industrial Development

A few large industries have obtained licenses from the Provincial Environmental Authority to draw water from wells and to discharge effluent at approved locations of the basin. On the other hand, small industries draw water from shallow wells, irrigation canals etc and discharge effluents to nearby locations without any permits. Although environment is a devolved subject, the provincial environmental authority does not have either capacity or the technical know-how to monitor these withdrawals and discharges. As such, water withdrawals and discharge of pollutants go unchecked. During dry spells, some industrialists have to obtain supplies of water from great distances through bowsers, thus increasing the cost of production considerably (ECL, 1999).

Inland Fisheries

Interest in the development of inland fisheries has shown a marked increase since 1994 and the fish-breeding center at Dambulla recommenced operations around this time. Inland fisheries is a subject jointly handled by the Wayamba Development Authority (on behalf of the Provincial Council) and the National Aquatic Resources Development Authority (on behalf of the Central Government). Fisheries development has received high priority in this basin and has expanded rapidly. The number of fingerlings provided

to the major tanks in the Deduru Oya basin has increased from 95,000 in 1999 to 130,000 by the year 2000 (North Western Provincial Council, 2000). In addition a large number of small tanks are also being used for stocking fish. There are also proposals to set up a fish fillet factory and a fish-meal factory in towns within the basin, which will require a significant increase in the fish population in the tanks. In time to come, fisheries could become a major water user and could even take priority over cultivation, because a minimum storage would have to be maintained in the tanks even under dry conditions.

The Institutional Setup, its Evolution and Government's Response to Change

The government policy over the years has been to transfer more and more water management responsibilities to communities. In line with this policy the Irrigation Management Division of the Ministry of Irrigation and Power commenced establishment of Farmer Organizations (FOs) in 37 major irrigation schemes as a pilot experiment in 1984 of which 3 lie within Deduru Oya basin. Transfer of secondary and tertiary canals to these organizations commenced in 1990. Subsequently these FOs were empowered to take larger management responsibilities through amendments to the Irrigation Ordinance and the Agrarian Services act in 1994. As a result this program received formal recognition. The ID too adopted this program for other major and medium irrigation schemes from 1986.

The Government of Sri Lanka has adopted management transfer as a policy in 1996 and made it mandatory for all agencies to turn over the management of all systems with command areas less than 400 ha, and secondary and tertiary canals in all other schemes to FOs. This turnover program is handicapped due to the absence of suitable procedures for proper administration and enforcement (e.g. mechanisms for dispute resolution).

The divisional agricultural committee and the district agricultural committee monitor issues related to water in agriculture, while development committees at these two levels and at provincial level monitor issues related to water resources in the province. These committees, made up of agency staff, suffer from the following weaknesses.

- Absence of representatives of user groups and other interested parties.
- Lack of a mechanism to resolve conflicts in a holistic manner.
- Inadequate technical guidance to the decision making process.
- No proper priority setting in resolving water-related issues.
- Insufficient flow of information both upwards and downwards through participants.
- Absence of a direct link between funding sources for water resources development and centers for coordination and conflict resolution.

As a further step towards community participation a partnership agreement for irrigation management transfer in the Ridi Bendi Ela Project in Deduru Oya basin has been entered into between a Community Based Organization (CBO) and the ID to examine its viability. The CBO is not only empowered but is also provided with the requisite managerial and technical skills and financial assistance under this project.

The NWS&DB is also launching a program to obtain the active participation of CBOs for the construction and management of community water supply projects and then handover the completed schemes for them to manage. Necessary amendments to the act to facilitate this process are underway. As all these initiatives are in an experimental stage it is too early to make any definitive comments but the results to date appear to be promising.

Rights for Irrigation Water

There has been no explicit recognition of rights for irrigation water in this country except in a few minor irrigation schemes where some traditional understanding is transferred through the generations. For instance, in some village tanks the water requirements for domestic use and fish raising must be satisfied before water can be allocated for irrigation in consultation of such communities. In major irrigation settlements the landholdings are of nearly equal area and access to water is through same sized outlets to maintain equity. But in reality, land at the head end of canals is more valuable than at the tail or middle, all other factors being similar. Such practices provide vital clues to the value that society places on water, facilitating the task of assigning different values to water according to its availability, access etc.

Introduction of such a system, with safeguards to protect the interests of marginal groups, will contribute to reducing waste and minimizing pollution apart from the savings in management effort. A major constraint in introducing such a system is the need for water measurement, which requires lot of investment and technical inputs.

Intersectoral Transfers

With population growth and greater urbanization, the demand for water from the domestic and industrial sectors will also increase. As such there could be a natural tendency for more and more water to be allocated for these sectors. However, during some periods of the year there is little or no flow out of the Deduru Oya basin (ECL, 1999; Sakthivadivel, 2000). Therefore, in such a 'closing' basin situation, increased demands for water from other sectors can be met only at the expense of supply to agriculture, or by storing flood flows in one or more reservoirs, or through demand management efforts.

The present institutional arrangement where each agency is trying to expand its customer base does not encourage thinking in a broad, national spirit. Instead, pressures will be exerted by various interest groups. This has already happened to the Ridi Bendi Ela Scheme in this basin. The irony is that in all these cases the present users were neither benefited by the new development (which is making use of the water used by them hitherto) nor compensated. The story may have been different if there had been stakeholder participation in a sincere partnership between users and agencies.

Enforcement

Most of the water-related agencies do not have the institutional capacity, technical capability, and administrative will to enforce and administer the respective acts they are responsible for. When the empowered authority does not take appropriate action under the relevant act, either the offenders go unchecked, or else the provisions in the criminal code are used, causing undue delays in judgements. The very purpose for which the different ordinances were passed is thus undermined. For example, for tapping water from unauthorized water sources there is provision to deal with offenders under the

Irrigation Ordinance as well as the Crime Ordinance. When action is not taken by the appropriate authority under the Irrigation Ordinance, the offence is dealt with under the Crime Ordinance. In the end, this kind of action does not encourage community participation in the management of public utilities.

Another case in point is that of sand mining, which has become a major concern in the Deduru Oya basin owing to the manner in which the operation is carried out. The function of the government is confined to the issue of permits. But the operators damage the rural road network, property and infrastructure in the vicinity, as well as the riverbank and the bed at will. This activity does indeed bring in lot of income and employment to the area but needs to be regulated to avoid such damages and to ensure long-term sustenance of the river. The much-needed technology, capacity and administrative will unfortunately do not seem to be available for the moment.

New Legislation

Proposed new legislation (in the pipeline) provides for meaningful representation of stakeholders and the provision of water rights to users. Transfer of user rights is also possible, thus providing more scope for arriving at tangible solutions that will compensate the losing party. This legislation is also expected to deal with questions related to entitlements and payments for water.

The presence of a neutral apex body that has the authority to mediate and negotiate on inter-sectoral issues in an objective and fair manner should enable rational allocation and protection of water resources. Arbitrary behavior on the part of officials and the influence of political interests could be minimized.

Private investors will demand secure water rights and the right to discharge effluents prior to making investments in any industry. This becomes practically an obligation for the Government, which is committed to providing employment for a growing population. The present institutional arrangements cannot find solutions to problems such as those related to the proposed Hambantota refinery. Under the new law, the issue of such entitlements becomes the responsibility of the proposed National Water Resource Authority, and enforcement is likely to occur in line with overall national policy, instead of in an *ad hoc* manner.

Conclusions

The most appropriate unit for the management of water in an integrated manner is the basin, especially when there is little or no scope for further development of water resources in the basin. Greater demands of water from one sector can only be met at the expense of water allocations to other sectors, notably agriculture. In order to manage this unit, one has to have an account of inflows, consumption (depletion) and outflows together with their temporal and spatial distributions. Such information is not always available to the degree of accuracy required by managers. The emphasis up to now has been on assessing water availability for the specific purposes and functions of a particular agency rather than on an integrated, basin-wide assessment to evaluate total water availability and use. However, the absence of such information should not deter managers from resorting to integrated water resource management using available techniques to estimate water availability and consumption with sufficient accuracy.

The entire population living in a basin become stakeholders in the water resource though there may be variations in the quantities consumed/used, the required water quality, the degree of pollution caused, and the degree of patronage received from the government. As such, any planning process has to include all stakeholders in a truly representative manner in order to make such an approach a success.

For a long time, the reluctance of government to remove state patronage for the provision of water for nationally important sectors like irrigation is a major constraint in implementing such a management mechanism. In a pilot study underway in the 2500 ha Ridi Bendi Ela irrigation scheme within the Deduru Oya basin, steps have been taken to empower the community, commercialize small farm agriculture, issue freehold land titles, establish a transparent mechanism for community participation etc. before embarking on the delicate step of granting water rights to stakeholders. More pilot experiments need to be undertaken. Careful analysis of their outcomes can help refine the proposed measures and interventions before they are finally incorporated into national policy.

The land ordinance introduced in 1947 was actually an excellent piece of legislation to facilitate management of water in a holistic manner. But this legislation was hardly used because each agency requiring water for development activities was empowered with an ordinance that protected the water use rights of its particular sector. Though small users could use water without securing rights, large private users were deprived of the available opportunity to secure water rights for development activities. The gravity of this gap in the law was felt only with the opening up of the country's economy, with private sector investors being called upon to participate in the development process.

Agencies or private individuals securing water from common sources could use them at will and the allocation system did not provide incentives for the agency or the users themselves to save water or to apply demand management mechanisms. Agencies expanded their user bases without adequate consideration for existing users as the relevant information was either not available or because there was no agency responsible to keep such records or to secure their rights. This has necessitated the country to develop laws that will encourage proper management of water by the users themselves, protect the rights of existing users, and fill the institutional gaps to fulfill these requirements.

References

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Figure 1: THE HYDROGRAPHY OF DEDURU OYA BASIN

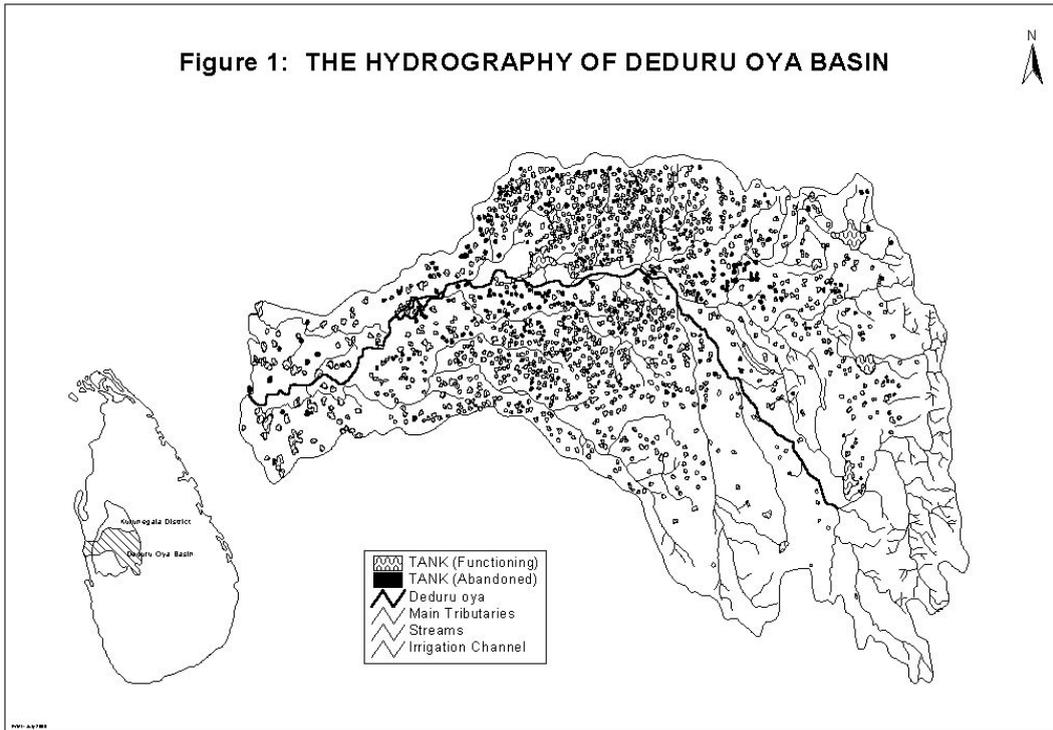
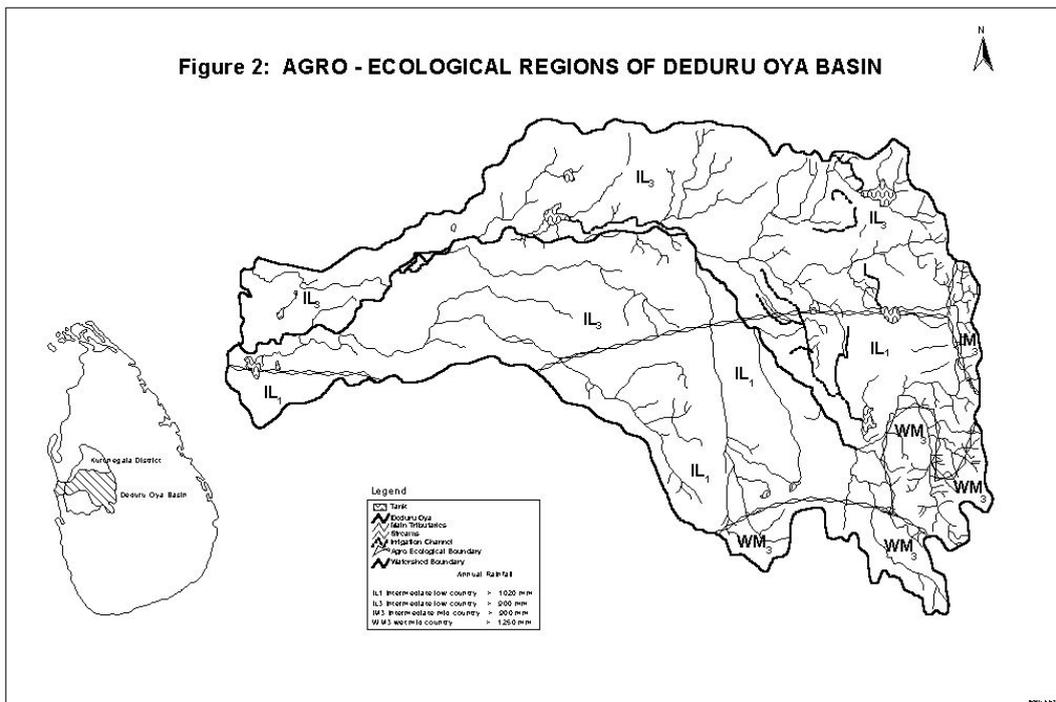


Figure 2: AGRO - ECOLOGICAL REGIONS OF DEDURU OYA BASIN



ANNEX
Salient Features of Deduru Oya Basin

1. Basin Geographical Area	:	2,623 sq km	
2. Main Administrative Units	:	Kurunegala and Puttalam Districts	
3. Population	:	926,103	
4. Average Population Density	:	350 per sq km	
5. Urban to Rural Population Ratio	:	1 : 10	
Average Population Growth Rate	:	1.2%	
6. Agro-ecological Zones	:	IL1, IL3, IM3, WM3	
7. Land Use	:	Paddy land	15%
		Other field crops	12%
		Chena land	6%
		Plantation	29%
		Grassland	2%
		Uncultivated	24%
		Forest	2%
		Homestead	10%
		Total	100%
8. Socio Economic Data			
Present per capita land	:	0.3 ha per person	
Land Holding pattern	:	Freehold	36%
		Encroached	28%
		Government Permit	35%
Total no. of farm families involved in agriculture	:	61,100	
Employment in public and private sector	:	20% of population	
People having access to pipe borne water supply	:	2% of population	
Cultivated highland crops (Chena)	:	8,775 ha (7% of basin area)	
Other Activities			
?		Poultry farming; Nurseries; Inland fisheries	
?		Livestock production (meat, milk, eggs)	
?		Coconut related industries; Food processing; Metal quarrying; Carpentry and Saw mills; Rice mills; Cement products and plastics	
Monthly income less than Rs. 1000	:	63% of the families	

9. Hydrometry

No. of rainfall stations	:	14	
No. of pan evaporation stations	:	3	
No. of river gauging stations	:	2	
Max period of record	:	Rainfall	1885 - 1998
		Evaporation	1976 - 1998
		Discharges	1979 - 1998
Average rainfall	:	Wet year	2,221 mm
		Normal year	1,494 mm
		Dry year	1,152 mm
Average pan evaporation	:	1,500 mm	

10. Water Accounting (Normal Year)

		MCM	%
Gross Inflow	:	4,397	100
Storage change	:	+165	4
Net Inflow	:	4,232	96
Process depletion	:	1,756	40
Non-process beneficial depletion	:	559	13
Non-process non-beneficial depletion	:	496	11
Uncommitted outflow	:	1,421	33
Floods	:	Major floods persist for 2 to 3 days. Not a major problem.	
Droughts	:	Droughts occur often: people have to walk 2-3 km to fetch drinking water.	

11. Groundwater Potential and Use

Type of Aquifer	:	Mostly hard rock (Minor extent:Alluvium)	
Groundwater recharge	:	452 MCM	
Groundwater usage	:	Drinking and domestic	57,332 m ³ /day
		Industrial	3,405 m ³ /day
		Agricultural	58,413 m ³ /day

12. Irrigation (Major and Medium Schemes)

Extent harvested and cropping intensity

Irrigation Scheme	Gross Extent (ha)	Harvested		Cropping Intensity %
		Yala 1997	Maha 1997/98	
Kimbuluwana Oya	673	673	673	200
Batalagoda	2,440	2,630	2,063	200
Hakwatuna Oya	2,047	324	2,047	116
Ridi Bendi Ela	2,428	1,692	2,428	170
Karawita	443	99	346	113

Paddy Productivity

	Ex-sluice duty (m)	Ave. yd t/ha	Value of prod. Rs/kg	Productivity	
				kg/m ³	Rs/m ³
Maha	1.22	4.5	10.50	0.37	3.87
Yala	1.63	4.0	10.50	0.25	2.58
Average	1.43	4.25	10.50	0.31	3.23

13. Irrigation (Major and Medium Schemes)

No. of irrigation Systems	:	Minor (< 40ha)	3,559
		Anicut System	37
No. of agrowells	:	2,100	
Extent Cultivated	:	950 ha	
Average Yield (Paddy)	:	Maha	3,500 kg
		Yala	3,000 kg

14. Institutions Managing Water

- ? Central and Provincial Irrigation Department
- ? National Water Supply and Drainage Board
- ? Water Resources Board
- ? Department of Environment
- ? Provincial Department of Agriculture
- ? Agrarian Services Department
- ? Agricultural Development Authority
- ? Inland Fisheries Department
- ? Water Users' Association

15. Coordinating Agencies for Water

- ? Divisional and District Agricultural Committee
- ? Project Management Committees of major irrigation projects
- ? Forest Protection and Law Enforcement Committee at Divisional and District level
- ? Environmental Coordination Committee

16. Water Related Issues

- ? Head-tail differences in basins' water use
- ? Deforestation leading to soil erosion and sedimentation
- ? Quality of groundwater deteriorating
 - Increasing salinity
 - Hardness and iron content
 - Sand mining of rivers
 - Lowering of water table
- ? Siltation of minor tanks
- ? Shrimp farming ? destruction of mangrove
- ? Excessive sand extraction from the river altering river profile
- ? Sources of point and non-point pollution
- ? Sea water intrusion